Anexa nr. 2

DISCIPLINE FILE (Subject content)

1. General informations

1.1 University	West University of Timisoara
1.2 Faculty	Physics
1.3 Department	Physics
1.4 Study direction	Physics
1.5 Study cycle	Master
1.6 Study program / qualification	Metode avansate de cercetare în fizică/Advanced research methods in physics (ARMP); according to COR: Physicist - 211101; Teacher - 233001; University Professor 231005

2. Subject matter information

2.1 Subject matter			Standard Model				
2.2 Teacher - course			Conf. Dr. Paul Gravila				
2.3 Teacher - Seminar, laboratory			Conf. Dr. Paul Gravila				
2.4 Year	I	2.6 Semester	II	2.7 Assesment type	E	2.8 Subject type	Ob

3. Study time distribution

3.1. Nr. of hours/week	4	In which: 3.2 course	2	3.3. seminar	2
3.4. Total hours in educational plan	56	In which: 3.5 course	28	3.6. seminar	28

Time distribution:	**h**
Study after lecture notes, bibliography or notes	30
Additional documentation in the library, electronic specialty platforms/ field	40
Seminar / laboratory preparations, homework, portofolio and essays	24
Tutoring	
Exams	
Other activities...	-

3.7. **Total number of personal study hour**	94
3.8. **Total number of hours in semester**	150
3.9. **Number of credits**	6

4. Preconditions (where appropriate)

4.1. curriculum	•
4.2. skills	•

5. Conditions (where appropriate)

5.3 for course	• Laptop + projector
5.4 for seminar/lab	• PC.

6. Specific skills gained

Professional and objective competencies of the discipline	1. Knowledge and Understanding: Description of physical systems using specific theories and instruments (experimental and theoretical models, algorithms, schemes, etc.) 2. Instrumental - Applicative: Using computers to control experiments or processes and to acquire data. 3. Attitudinal: Scientific discernment. 4. Transversal competences: Effective use of information sources (internet).

7. Course objectives

7.1 Main objective	Understanding the fundamental concepts of the actual Standard Model of the structure of Matter.
7.2 Specific objectives	Understanding methods used in High Energy Physics

8. Content

8.1. Curs	Teaching methods: Discussions, Board and chalk, projector.
1.	What is a Standard Model? How the standard model has evolved from antiquity to the present.
2.	Dimensions scale.
3.	A brief history of the discovery of elementary particles.
4.	Standard Model I. Particles of Matter – fermions.
5.	Standard Model II. Fundamental Forces – bosons.
6.	Interactions. Exchange particles.
7.	QED Feynman Diagrams.
8.	Mesons and Baryons.
9.	Quantum numbers. The concept of Isospin.
10.	Feynman diagrams for the weak interaction. Disintegrations.
11.	Heavy quarks.
12.	Discrete symmetries. CPT Theorem. Parity violation.
13.	The K-mesons and the CP violation experiment.
14.	Beyond the Standard Model.

8.2. Seminar:	
1.	Discuss the issues taught at the course (permanent).
2.	History of particle detectors. The cloud and the bubble chamber.
3.	Calculating a Pion decay event using the Onscreen PP. bubble chamber simulator software. *
4.	Discovery of the top quark at Fermilab.
5.	Physics at CERN I. The accelerator.
6.	Physics at CERN II. Detecting particles. The ATLAS detector.
7.	Physics at CERN III. Online and offline computing system. The two-level trigger.
8.	Physics at CERN IV. Visualizing events using Minerva. *
9.	Physics at CERN V. Higgs events. W- and Z- path. * ***** computer lab.

Bibliography

1. The Standard Model in a Nutshell, Dave Goldberg, Princeton University Press (2017).
2. Introduction to Elementary Particles, David Griffiths, Wiley-VCH (2010).
3. Review of Particle Physics, Particle Data Group, http://pdg.lbl.gov
4. C. Quigg, Gauge Theories of the Weak, Strong and Electromagnetic Interactions, Benjamin/Cummings Publ. USA (1983).
5. G. Musiol et al, Kern- und Elementarteilchenphysik, Verl. Harri Deutsch (1995).
6. Quang, H. K., Pham, X. Y., Elementary Particles and Their Interactions, Springer Verl. (1998).
7. S. L. Lloyd, Elementary Particle Physics Course PHY653, University of London, UK (1999).
8. Cheng, Li, Gauge theory of elementary particle physics, Oxford Scientific Publ. (1984).
9. B. Povh et al, Particles and Nuclei, Springer Verl. (1999).
10. www.cern.ch (online resources)
11. CERN Minerva software package, sample data and documentation.
12. Communication and sharing of course material using institutional email and/or elearning.

Assesment

Activity during the semester; polls (50%), multiple choice test (50%).

Date:

25.01.2024

Course holder (Signature):

Director of department (Signature):